LANE DETECTION AND RACKING USING FUZZY LOGIC

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Abstract: In general, the detection of road lane from a camera for traffic surveillance is done by analyzing the geometric forms of the road .so Hough transform or B-Snake technology is preferred to smart pattern matching or machine learning like neural network. We insist, through, that the feasibility of using smart technique in this area is quit undervalued. This paper proposed, by extremizng the RGB path, we first divide the image into halves and use only the lower part for detection and binarization. The boundary lines are then extracted by the applying four directional counter tracking algorithms, and vectors with distance and angle values are extracted from those boundary lines to be used as inputs for the clustering algorithm for fuzzy clustering algorithm. Experimental result shows that the smart method proposed is slightly slower than Hough transform but better accuracy, so there is space for such methods to solve this problem.

Keywords: Lane Detection, fuzzy, B-snake

1. INTRODUCTION:

Recently commonly used image processing applications is Intelligent Transport system with CC-TV [1]. Lane detection is one of the simple yet important algorithms in the analysis of such images. It is a basic building block of many application of traffic analysis, such as detection of lane shifts and detections of collisions. now a day's research has been done on lane detection for intelligence vehicles. In this paper polar coordinate [2] and B-snake technology [3] are two algorithm used for finding Hough area.

However, one can argue that these algorithm are basically based on the schemes for linear processing is to use MIMD with parallel processing to obtain maximum resources utility as an example, such as cloud system.
From that perspective, we argue that even in low-level software applications, a framework based on artificial intelligence such as fuzzy logic or neural network may e move powerful than linear system in such environment [4] such smart technique have been largely overlooked in issues such as lane detection because Hough transform or B-snake simply looks more effective in linear processing.

2. LANE DETECTION USING FUZZY LOGIC

In current experiment we use 640 x 480 size 24 bit BMP format for input image in to halves and use only the lower part in detection and binarize them by analyzing RGB channel. Mainly we use only lower half as upper half part has small portion of information about road lane details, so considering the thus it is inefficient consider the pro-cessing period , it is inefficient. Road lane are normally white or yellow so we are binarizing them as such, the boundary lines are then extracted using a four directional contour tracking algorithm [5] and pixel of less than 90 are removed

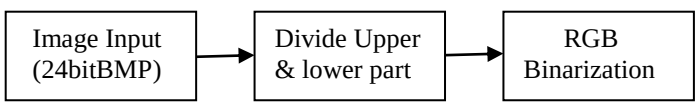

Fig.1 Block diagram of image preprocessing

By applying formula (1) input characteristic vectors are extracted by taking distance and the angle for every 40 pixels

$$V_i = \begin{cases} Dist(P_{k\ mod\ 40}, P_{k\ mod\ 40+40} \\ Ang(P_{k\ mod\ 40}, P_{k\ mod\ 40+40} \end{cases} \quad \text{------ (1)}$$

Where P is the coordinate of the boundary line.
Figure 2 shows the extraction process of image segmentation

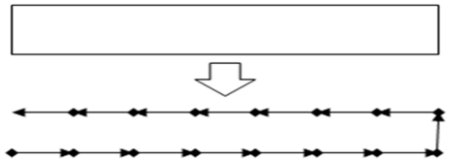

Fig.2. Feature extraction vectors

The FCM clustering [6] originally developed by bezdek in 1973, it is an algorithm classification that lists the degrees of cluster membership for each data based on the distance from the centre. And 1 and the accumulative sum of data set is 1. In formula (2), Uik denotes that i[th] Cluster belongs to the degree of the membership of k^{th} results.
The j^{th} cluster core is commonly published by formula (3). Then the new degree of membership $U_{ik}(r+1)$is determined by formula (4). The procedure is repeated until the difference between the new and old membership degree

is smaller than the threeshold value, resulting in clustering of input vectors such as

$$\sum_{i=1}^{c} U_{ik} = 1, \quad k = 1,2,3, \ldots . n \qquad \text{----------(2)}$$

$$v_{ij} = \frac{\sum_{k=1}^{n} (U_{ik})\, x_{kj}}{\sum_{k=1}^{n} (U_{ik})^{m}} \qquad \text{----------(3)}$$

$$U_{ik} = \frac{1}{\sum_{k=1}^{c} \left(\frac{(d_{ik}{}^{r})}{(d_{jk}{}^{r})} \right)^{\frac{2}{m-1}}} \qquad \text{----------(4)}$$

Figure 3 shows plotting of input vector set in to FCM

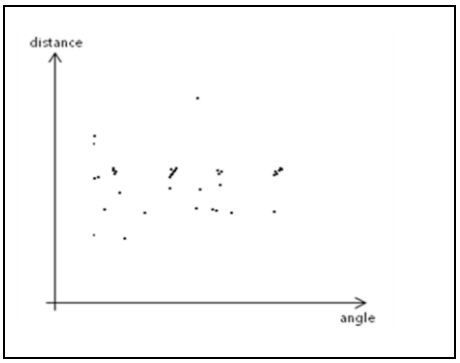

Fig.3. Vector graph

Naturally, as shown in figure 3, input vectors from a loosely coupled cluster because vectors from the same straight line have similar distances and angles. When we use FCM we can have the number of clusters resulting from this paper and it was 4. After applying FCM the vectors are clustered more precisely as shown in figure 4. Figure 5 shows the FCM result as compared to the original image.

The input image Fig.5 (a) is divided into two parts and the lower half is bi-narized (Figure 5(b)) and 4-directional contour tracking algorithm (Fig. 5 (c)) is applied and the characteristic vectors are extracted (Fig. 5(d)) and FCM is divided to them as shown Fig.5(e)

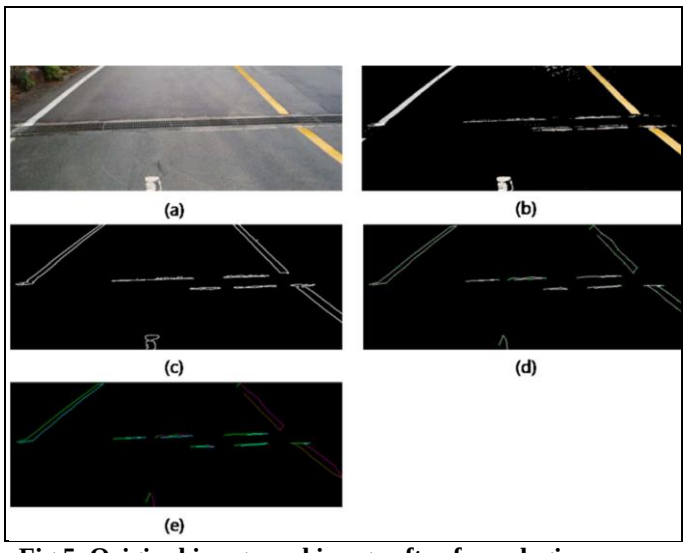

Fig.5. Original image and image after fuzzy logic

3. Experimental Result and Analysis

The main clustering algorithm FCM by nature requires fixed initial number of clusters. While that is the main shortcoming in this type of application, we use the number of cluster from 3 to 6 and compared them in Fig.6. Fig.6 (b) has cluster number 3 and Fig,6(c) has number 4: Fig. 6(d) has number 5 and Fig,6(e) has number 6

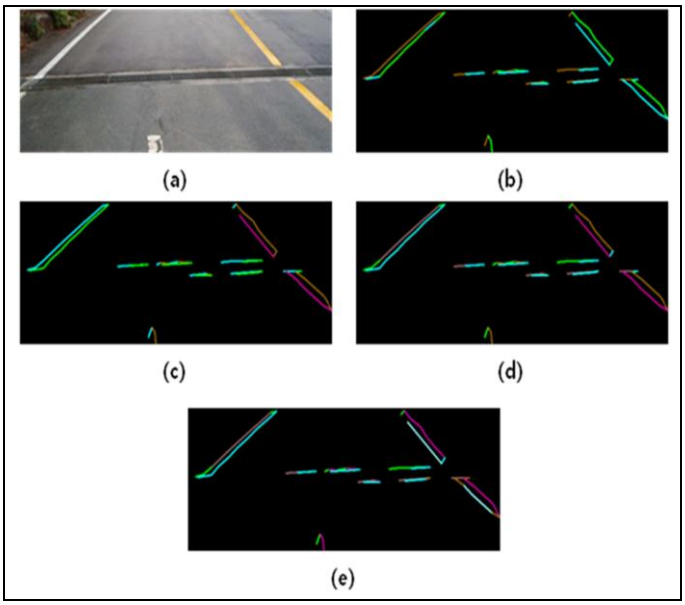

Fig.6 Experiment on the number of cluster

4. Conclusion

The general idea of applying intelligent algorithms such as fuzzy logic or neural network is to find an application that is not too velocity – sensitive and has less formal details such as geometric properties, but its ability to implement parallel processing scheme is another benefit in expanding its usability. Our idea here is to use FCM in low level ITS with well-deserved formal characteristics such as lane detection can only verify that the smart algorithm has not been de revalued in such problems and can also be applied in real time if the environment allows (or requires) non- linear processing environment

In our experiment, simple characteristic vectors extracted by image preprocessing are successfully clustered into a straight line without losing lane information even with real world roadways partially disconnected. The current approach can, however , only be extended to straight lines and create certain amount of false positive objects and these problem can only motivate us to do more study.

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References

[1] Palen, J. (1997). The need for surveillance in intelligent transportation systems. part two. intellimotion. Vol. 6, no. 2.

[2] Yu, B., & Jain, A. K. (1997, October). Lane boundary detection using a multiresolution hough transform. In *Proceedings of International Conference on Image*

Processing (Vol. 2, pp. 748-751). IEEE.

[3] Wang, Y., Teoh, E. K., & Shen, D. (2004). Lane detection and tracking using B-Snake. *Image and Vision computing*, *22*(4), 269-280.

[4] Kim, K. B., Cho, J. H., & Kim, C. K. (2005, December). Recognition of passports using FCM-based RBF network. In *Australasian Joint Conference on Artificial Intelligence* (pp. 1241-1245). Springer, Berlin, Heidelberg.

[5] Babuška, R. (2012). *Fuzzy modeling for control* (Vol. 12). Springer Science & Business Media.

[6] Shin, W. S., Song, D. H., & Lee, C. H. (2006). Vehicle Classification by Road Lane Detection and Model Fitting Using a Surveillance Camera. *JIPS*, *2*(1), 52-57.